WHAT IS CLAIMED IS:

1. A lithographic apparatus comprising:

an illumination system to provide a projection beam of radiation, the illumination system defining an intensity distribution in a pupil plane, the illumination system comprising a first optical element constructed and arranged to deflect the projection beam over a first range of directions with a direction dependent intensity distribution determined by the optical element;

a support structure to support a patterning device, the patterning device serving to pattern the projection beam according to a desired pattern;

a substrate table to hold a substrate; and

a projection system to project the patterned beam onto a target portion of the substrate;

a second optical element optically following said first optical element in a path of the projection beam, the first optical element and the second optical element each being arranged to pass a major part of the projection beam substantially without deflection, the second optical element deflecting a portion of the major part of the projection beam passed by the first optical element over a second range of directions with a direction dependent intensity distribution; and

a transmission blocking element to block transmission to the substrate of the part of intensity of the projection beam passed undeflected by both the optical element and the second optical element.

2. A lithographic apparatus according to Claim 1, comprising a plurality of further optical elements, successively following said first optical element in the path of the projection beam, each further optical element passing a major part of the projection beam incident thereon substantially without deflection, and each providing for deflection of the projection beam received from the preceding optical elements over a respective range of directions with a respective further direction dependent intensity distribution.

3. A lithographic apparatus according to Claim 1, wherein the first optical element and the second optical element provide for mutually different direction dependent intensity distributions as a function of an angle of rotation around a normal beam direction.

4. A lithographic apparatus according to Claim 3, wherein the first optical element provides for an intensity distribution with one of a first intensity level and a zero intensity level as a function of rotation around the normal beam direction, the second optical element providing for an intensity distribution with one of a second intensity level different from the first intensity level and a zero intensity level as a function of rotation around the normal beam direction.

5. A lithographic apparatus according to Claim 1, wherein each optical element contains an array of microlenses across a cross-section of the beam.

6. A lithographic apparatus according to Claim 5, wherein the radiation source is substantially monochromatic at a first wavelength, the microlenses each include thickness steps so as to keep a range of thickness values of the microlenses within a predetermined range and to optimize efficiency of the microlenses at a second wavelength, the first wavelength differing from the second wavelength such that the efficiency at the first wavelength is low relative to the efficiency at the second wavelength.

7. A lithographic apparatus according to Claim 1, comprising an optical element exchange unit, the exchange unit comprising a storage unit having a plurality of positions for premanufactured optical elements, each optical element providing for a respective direction dependent intensity distribution, the exchange unit being arranged to allow movement of at least a selected one of the premanufactured optical elements to a position in the lithographic apparatus to function as said second optical element.

8. A lithographic apparatus according to Claim 7, comprising a plurality of respective sets of optical elements, each respective set containing one or more optical elements that determine the intensity in the pupil plane in a respective range of positions specific to the respective set, the exchange unit being arranged to place independently selectable ones of the premanufactured optical elements of the respective sets into successively different positions in a series arrangement.

9. A device manufacturing method comprising:

providing a substrate that is at least partially covered by a layer of radiation-

sensitive material;

providing a projection beam of radiation using an illumination system;

deflecting a projection beam of radiation with a first optical element over a range of directions with a direction dependent intensity distribution determined by the optical element and passing a major part of the beam substantially without deflection;

patterning the projection beam with a pattern in its cross-section; and

projecting the patterned beam of radiation onto a target portion of a layer of radiation-sensitive material on a substrate;

deflecting the passed portion of the projection beam over a further range of directions with a direction dependent intensity distribution with a second optical element and passing a major part of the projection beam substantially without deflection; and

blocking transmission to the substrate of the part of the projection beam passed undeflected by both the first optical element and the second optical element.

10. A device manufacturing method according to Claim 9, further comprising passing the projection beam through a plurality of further optical elements, each further optical element passing a major part of the projection beam substantially without deflection, and each providing for deflection of the major part of the passed intensity of the projection beam received from the preceding optical elements over a respective range of directions with a respective further direction dependent intensity distribution.

11. A device manufacturing method according to Claim 9, wherein the optical element and the further optical element provide for mutually different direction dependent intensity distributions, as a function of an angle of rotation around the normal beam direction.

12. A device manufacturing method according to Claim 11, wherein the first optical element provides for an intensity distribution with one of a first intensity level and a zero intensity level as a function of rotation around the normal beam direction, the second optical element providing for an intensity distribution with one of a second intensity level different from the first intensity level and a zero intensity level as a function of rotation around the normal beam direction.

13. A device manufacturing method according to Claim 9, wherein each optical element contains an array of microlenses across a cross-section of the beam.

14. A device manufacturing method according to Claim 13, wherein the radiation is substantially monochromatic at a first wavelength, the microlenses each include thickness steps so as to keep a range of thickness values of the microlenses within a predetermined range and to optimize efficiency of the microlenses at a second wavelength, the first wavelength differing from the second wavelength such that the efficiency at the first wavelength is low relative to the efficiency at the second wavelength.

15. A device manufacturing method according to Claim 9, further comprising selecting a series of optical elements, from a respective one of a plurality of sets of optical elements for determining an intensity distribution in the pupil plane and placing the selected optical elements in series in the projection beam.

16. A device manufacturing method according to Claim 9, wherein the first optical element and the second optical element are part of a series of optical elements that each pass a majority of the projection beam undeflected, each optical element of the series determining a rotation angle dependent intensity distribution in a respective ring around a centre of the pupil plane.

17. A device manufacturing method according to Claim 16, the method comprising rotating the optical elements of the series so as to rotate the rotation angle dependent intensity distribution.

18. An illumination optical system for use in a lithographic projection apparatus, comprisng:

a first optical element constructed and arranged to deflect a portion of a beam of radiation over a first range of directions with a direction dependent intensity distribution determined by the first optical element, such that a first deflected portion of the beam has less energy than a first undeflected portion of the beam;

a second optical element optically following said first optical element in a path of the projection beam and constructed and arranged to deflect a portion of the first

undeflected portion of the beam from the first optical element, and producing a second direction dependent intensity distribution determined by the second optical element, such that a second deflected portion of the beam has less energy than a second undeflected portion of the beam; and

a blocking element to block transmission to the substrate of the second undeflected portion.